



GPC and Agilent PolarGel-M Columns for the True Representation of Novolac Resins

Application Note

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Introduction

Novolac resins are thermoplastic materials made with an excess of phenol in an acid catalyzed reaction with formaldehyde. Novolacs are commonly employed as photoresists (light-sensitive materials used to form patterned surface coatings) and in varnishes. They have higher heat distortion temperatures and tend to be more expensive than regular epoxy resins.



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GPC Analysis

PolarGel-M GPC columns are packed with low swell, macroporous copolymer beads that have a surface of balanced polarity, comprising hydrophobic and hydrophilic components. These allow PolarGel-M to be used in the analysis of high polarity polymers that are insoluble in water to give a more accurate representation of the molecular weight distribution of the polymer. If these polar polymers were to be analyzed with traditional styrene/divinyl benzene columns, interactions would cause artifacts in the peak shape and longer retention times, which would translate into apparently much lower molecular weight averages.

Sample Preparation

Two novolac resins were analyzed to obtain an indication of differences in molecular weight, if any. The samples were made up at 0.2 % (w/v) in DMSO, with 0.1 % LiBr added to reduce sample aggregation, and injected without further treatment.

Conditions

| | |
|-------------------|--|
| Columns: | 2 x PolarGel-M, 300 x 7.5 mm (p/n PL1117-6800) |
| Eluent: | DMSO & 0.1 % LiBr |
| Flow Rate: | 1.0 mL/min |
| Injection Volume: | 100 μ L |
| Temperature: | 50 $^{\circ}$ C |
| Detectors: | Agilent PL-GPC 50, RI |

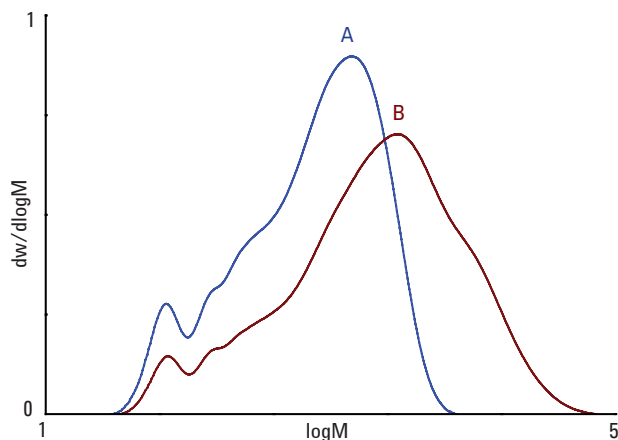


Figure 1. Overlaid molecular weight distributions of two novolac resins

Results

Figure 1 shows the overlaid molecular weight distributions of two novolac resins.

Conclusion

GPC with PolarGel-M columns allows for the artifact, interaction free calculation of the composition and molecular weight distributions of novolac resins that are difficult to analyze on traditional, organic (PS/DVB) GPC columns.

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